Highly Migratory Species For-Hire Survey – Florida Pilot Study

Final Report

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&
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Executive Summary only

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EXECUTIVE SUMMARY

Each year, millions of recreational anglers enjoy Florida's diverse marine fisheries. Florida's popularity as an international fishing destination currently supports the world's largest for-hire fleet of 2,100 charterboats and guides; sustaining thousands of jobs and generating significant economic benefits to local communities. A large segment of the state's for-hire fleet regularly targets highly migratory species (HMS), including billfish, swordfish, tunas, and sharks. The NOAA Fisheries Marine Recreational Fisheries Statistics Survey (MRFSS) has been the primary method for monitoring recreational catch in Florida since 1980. Conducted by the State's Fish & Wildlife Research Institute since 1998, the MRFSS Access Point Angler Intercept Survey (APAIS) has averaged 40,000 angler trip interviews annually.

Despite the robust sample size of the general survey, HMS-targeted trips comprise a small portion of all recreational saltwater fishing trips, and therefore are a "rare event" in any survey not directly targeting this specific segment of the recreational fishery. Several factors associated with HMS fishing contribute to the low number of intercepted trips including: 1) the rare occurrence of many HMS in general, 2) spatial and temporal characteristics of some HMS fisheries that make them more difficult to monitor (*e.g.,* night swordfish trips), and 3) high voluntary release rates of billfish and sharks that limit the likelihood of encountering landed catches. As a result, typically low MRFSS APAIS sample sizes result in highly imprecise catch estimates for nearly all HMS species.

The apparent deficiencies and data gaps with the MRFSS and alternative federal HMS data collection programs, such as the HMS Non-Tournament Reporting (NTR) telephone hotline/website, warrant a more directed approach to adequately monitor recreational HMS fisheries. This study was initiated as part of the Marine Recreational Information Program (MRIP), to assess the feasibility of employing a directed HMS survey with for-hire vessels in the southeastern United States, similar to the Large Pelagic Survey (LPS) conducted from Maine to Virginia. Over a 14-month period, directed sampling was conducted through weekly field and telephone surveys with the aim of intercepting for-hire trips in which HMS were targeted and/or caught (referred to as HMS trips). Sampling activities for this study were limited to the Florida Keys (Keys) and Southeast Florida (SEFL) where a high concentration of for-hire vessels that regularly target HMS is present. In addition, a one-time characterization census of all for-hire vessels in Florida and HMS Charter/Headboat permitted vessels in South Florida was conducted to better describe the scope and magnitude of HMS fishing within this sector of the recreational fishery. The study results were expanded to produce preliminary estimates of HMS effort and species-level catch. Spatial and temporal patterns of each HMS fishery were also characterized, as well as the extent of nighttime fishing activity, the use of private access sites, and tournament participation among the for-hire vessels and HMS permit holders.

The primary objective of the Field Intercept Survey (FIS) design was to efficiently and comprehensively intercept for-hire HMS trips and landed catches while maintaining the integrity of the survey design. This was achieved through a clustering approach that grouped multiple access sites with for-hire vessels that transited a common ocean access point (*i.e.,* inlets, passes, cuts). The design also included conducting interviews at the vessel-level with the captain or crew member. Conducted as a modified roving creel survey, the site cluster design extended coverage to all vessels operating from both high and low pressure sites within a central area, enabling each field assignment to collect a more representative sample of for-hire fishing for that day. By designating the site cluster as the primary sampling unit, sampler movement to all sites within the cluster was accounted for in the probability sampling design of the survey; with more than half of all vessel interviews being collected at secondary

sites. Overall, samplers missed less than 10% of all for-hire vessels actively fishing within the cluster, and only 7% of vessels at the primary site. The expanded coverage and high sampling efficiency achieved by the cluster sampling approach would not have been possible had vessel interviews been collected at the angler-trip level. The frequent departure of for-hire customers immediately after the conclusion of a trip limits the ability of samplers to interview all vessels at an access site that return at similar times, let alone at different sites. For-hire captains overwhelmingly expressed their preference that they or their crew be interviewed during the FIS instead of their customers as in the APAIS. The FIS design also collected a more representative sample of for-hire fishing activity compared to the APAIS by conducting FIS assignments until all for-hire vessels had returned to their dock for the day or until 20:00 hours.

The existing For-Hire Telephone Survey (FHS) was modified to include an HMS add-on questionnaire to expand the collection of HMS catch data. The FHS estimated HMS effort, and produced HMS released catch and landings estimates by species. The collection of catch data through a recall survey has traditionally been discouraged due to reliability concerns for self-reported information. This study utilized a relatively short recall period (1-week) to minimize recall bias and employed a complementary on-site intercept survey (the FIS) for catch rate comparisons. In addition, the FHS was complemented by the HMS Charter/Headboat Telephone Survey (CHS) that used the HMS Charter/Headboat permit list as a dual sample frame to expand coverage of for-hire vessels with the HMS permit that were not on the FHS frame. Vessels were moved from the CHS frame to the FHS frame once they were confirmed to be active for-hire vessels. The dual frame design successfully improved coverage of the for-hire fishery by reducing the proportion of "off-frame" vessels intercepted by the FIS and by facilitating more timely updates to the FHS vessel frame.

FIS sampling was initiated on April 29, 2008 and concluded on June 28, 2009. Of the 488 attempted assignments, 440 (90.2%) resulted in at least one vessel interview being completed. A total of 2,276 vessel interviews were conducted throughout the study area, with 39.0% classified as HMS trips. FIS results indicated 91.8% of HMS trips were conducted by vessels on the FHS sample frame, with an additional 2.5% by vessels on the CHS frame.

The modified FHS was conducted throughout the same time period as the FIS. A total of 4,242 vessel selections were drawn, of which 62.4% were contacted and cooperative, 25.3% were unable to be contacted, and 12.4% were non-cooperative. Of the 4,165 trips reported during the FHS, 23.7% were classified as HMS trips. The CHS was conducted over 12 months from July, 2008 through June, 2009, during which 1,043 vessel selections were drawn. Although 68.0% of permit holders were contacted and cooperative (24.2% unable to be contacted, 7.8% non-cooperative), large proportions of vessels were reported to be inactive or ineligible, with only 42.2% of all selected permit holders reporting their vessels were available to fish in South Florida.

The combined results of the FHS and CHS (Combined Telephone Surveys or CTS) produced an effort estimate of 15,439 HMS trips (proportional standard error - PSE 5.2%) conducted by for-hire vessels from July, 2008 through June, 2009. Approximately 73% of the trips occurred during a 6-month period from November through April, with a peak activity of 4,603 trips (PSE 10.6%) taking place during the January-February sample wave. This is consistent with South Florida's traditional tourism season, as well as with the peak abundance of sailfish in this area.

HMS trips were classified into five HMS groups for the trip-level analysis: sailfish, marlin, swordfish, tunas, and sharks. Results from both the FIS and CTS showed catches for all HMS groups occur

throughout the year, with seasonal shifts among the preferred target species. Sailfish was the most common and widely targeted HMS in South Florida, accounting for 71.5% of all HMS charter trips and more than two thirds of the estimated HMS total catch. More than two thirds of sailfish trips occurred from November to April, tuna and marlin trips occurred primarily during the late spring to summer months, and swordfish trips were more common during the summer and fall. Shark trips were more evenly distributed throughout the year, but were more frequent during the winter-spring tourism season.

Study results showed differences in trip durations, distance from shore, and vessel return times among the HMS groups. More importantly, a regression analysis comparing sailfish CPUEs from trips that returned before and after 15:00 hours confirmed there are significant differences in catch rates from for-hire vessels that return at different times of the day. The results demonstrate the necessity to extend sampling coverage to trips returning throughout the day in order to account for the diversity of trip types that occur within this region. Discontinuing field assignments prematurely would have biased the sample towards trips that fished less time, closer to shore, and/or earlier in the day.

The CTS estimated a total of 20,631 sailfish (PSE 9.7%) caught during the 12-month period, of which only 56 sailfish (PSE 50.1%) were estimated to have been landed. The total catch estimate for blue marlin was 131 fish (PSE 40.0%), all of which were reported to have been released alive. An estimated 421 swordfish (PSE 29.8%) were caught, of which 123 fish (PSE 41.4%) were landed. Skipjack tunas were the most common tuna species caught, accounting for 75% of the total tuna catch estimate (2,479 fish, PSE 25.1%), more than half of which were landed (1,323 fish, PSE 26.7%). Yellowfin tuna were the next most common tuna species reported, with a total catch estimate of 502 fish (PSE 38.9%), of which 437 were landed (PSE 43.4%). The total shark catch (all species combined) was estimated to be 5,562 sharks (PSE 15.8%), with only 122 sharks (PSE 35.5%) estimated to have been landed. Lemon sharks accounted for largest portion of the total shark catch estimate with 2,144 sharks (PSE 33.1%), all of whom were released. Bull sharks had the highest precision among the shark groups, with a PSE of 23.8% (total catch 757 sharks).

A total of 592 vessels in the Keys and SEFL possessed HMS Charter/Headboat permits at the end of the study. Approximately 80% of these permitted vessels were reported to be active in South Florida, of which most were for-hire vessels on the FHS frame. It should be noted nearly 19% of these active vessels were used exclusively for private recreational trips, with the vessel representatives reporting no intention of conducting for-hire trips in the near future.

The characterization survey successfully interviewed 57.8% of all 2,077 for-hire vessels throughout the State of Florida, but only 40.0% of 260 CHS frame vessels in South Florida. Of the 520 for-hire vessels throughout Florida that possessed HMS permits (FHS-HMS vessels), 67.6% reported having targeted HMS within the past 12 months, averaging 54.3 targeted trips/year. By comparison, 23.9% of 1,557 FHS vessels without permits (FHS-Only vessels) reported having targeted HMS at least once, averaging 37.4 trips/year. Of the FHS-HMS vessels, most targeted billfish (78.2% - averaging 52.6 billfish trips/year), followed by sharks (39.9%, 18.7 shark trips/year), swordfish (37.8%, 10.7 swordfish trips/year), and tunas (24.9%, 16.7 tuna trips/year). In contrast, most FHS-Only vessels targeted sharks (77.6%, 22.4 trips/year) and billfish (44.4%, 40.9 trips/year), whereas only 10.7% targeted swordfish (13.3 trips/year) and 5.6% tunas (8.8 trips/year). Among the characterized CHS vessels, 93.3% reported targeting HMS at least once within the past 12 months, but only averaging 27.8 targeted trips/year. Most CHS vessels targeted billfish (91.3%, 22.7 trips/year), whereas 53.3% targeted swordfish (6.3 trips/year), 32.6% targeted tuna (12.1 trips/year), and 13.0% targeted sharks (8.4 trips/year).

Characterization survey results clearly indicate HMS fishing is common among many for-hire vessels that do not possess HMS permits. Likewise, both the FIS and CTS results showed a large proportion of HMS charter trips were conducted by non-permitted vessels (FIS=44.5%, CTS=40.4%). Although many of these trips occurred in State waters where the permit is not required (except for tunas), approximately 20% of all HMS targeted charter trips reported were by non-permitted vessels fishing in Federal waters. Compliance with the permit requirement was lowest among vessels targeting marlin, with only 43.6% of FIS marlin trips being conducted by permitted vessels. Non-permitted vessels also accounted for nearly 40% of FIS and 25% of CTS targeted tuna trips (the State waters exemption does not apply to tunas).

A comparison of catch rates between field and telephone survey methods clearly showed sailfish catches reported to the FHS were significantly greater than those collected during the FIS (FHS=1.63 sailfish per targeted trip, FIS=1.12 sailfish per targeted trip; $P<0.01$). The apparent difference in catch rates between the surveys could be attributed to vessel representatives over-reporting trips in which at least one sailfish was caught in the FHS, rather than inflating the number of sailfish caught on these successful trips. In spite of short recall periods, vessel representatives may have confused trips, especially during weeks when they fished more frequently (or even multiple times a day), often targeting similar species. This would be consistent with other studies that have noted more active participants being more susceptible to recall errors.

Potential recall bias in the self-reported catch was investigated by comparing matching trips sampled by both the field and telephone surveys. Analysis of 36 matched sailfish trips sampled by both the FIS and FHS did show identical sailfish catch information for 81% of the trips and an overall mean difference of less than $1/10^{th}$ of one fish between the two records that was not significant (mean difference=-0.06, $P=0.53$). When the comparison was limited to only trips reporting at least one sailfish caught (N=17 trips), similar catches were reported for only 59% of the matched trips; however, the mean difference again was small and not statistically significant (mean difference=-0.12, $P=0.54$). Although the matched trip sample size is low, the results indicate differences in sailfish catches reflect random variability and not systematic recall error. In contrast, the matched trip analysis indicated recall of the number of customers reported to be carried on for-hire vessels in the telephone surveys was poor. Among 95 matched HMS and non-HMS trips, only 50.5% of the responses were in agreement and the mean difference of 0.34 more FHS anglers was statistically significant ($P<0.01$). Considering the FHS produces angler-trip estimates for the MRFSS, these results warrant further study to determine if there is a systematic bias towards over-reporting the number of anglers in the FHS.

Collecting catch information in the FHS did increase HMS catch sample sizes, especially for less common species such as swordfish and blue marlin. In addition, the FHS catch data was used to determine compliance rates with the mandatory reporting requirement for landed sailfish and swordfish catches to assess the accuracy of the attempted NTR census. Considering the minimal cost involved with collecting HMS catch data during FHS sampling, this data source could be used to help monitor changes in HMS catch rates if collected over an extended period of time across a larger geographic area.

Both survey methodologies failed to significantly increase the number of landed HMS catches. During 14 months of directed sampling in one of the most active HMS fishing areas within the United States, billfish, swordfish, and shark landings were rare events; with a combined total of only 28 fish observed at the dock. To a large degree, this is a reflection of the growing conservation trend to release these species alive. The onset of the economic recession in September 2008 is also believed to have reduced the number of landed HMS catches as for-hire captains anecdotally reported fewer customers were

interested in paying for taxidermy mounts (the primary disposition of landed shark and sailfish catches in this region). Landed HMS catches were reported even less frequently during the telephone surveys, despite recording more catch reports, indicating that there may also be a reluctance to self-report landed catches for some species. The great expenditure of effort by the FIS to intercept so few fish, and the poor precision of CTS self-reported landings estimates, clearly demonstrates surveys will not be a cost-effective method for accurately monitoring HMS landings by the for-hire industry in this region. Unfortunately, the study results provide clear evidence that compliance with the existing mandatory reporting requirement of landed billfish and swordfish is poor, indicating the program is not achieving a complete census of landed catch. Only 32% of sailfish (N=22) and 62% of swordfish (N=13) reported or observed to have been landed during the FIS and CTS were matched to fish in the NOAA Fisheries NTR database. A modified census-based approach is recommended if accurate landings are required for these species.

The National Research Council's (NRC) 2006 review of the MRFSS identified potential under-coverage bias associated with access point surveys with regards to nighttime fishing, trips returning to private access sites, and tournament fishing. Overall, results of this study indicate that the potential for bias associated with each factor is limited in the South Florida for-hire HMS fishery. The fishery is conducted almost exclusively during daylight hours (97% of all HMS charter trips). The characterization survey indicated that the use of private access sites was limited, as less than 10% of all for-hire vessels within the Keys and SEFL study area used private access sites as their primary site for directed HMS fishing. Trip level results showed under-coverage was even less evident, as private access fishing accounted for less than 3% of all HMS charter trips reported in the telephone surveys. Tournament fishing during HMS trips was also rare, accounting for only about 4% of all charter trips sampled in both survey formats.

Nonetheless, the study results highlight two aspects of the for-hire HMS fishery that warrant more attention. Approximately 40% of CTS swordfish trips returned at night between 20:00 and 08:00. Directed night sampling was conducted as part of the FIS, but yielded only four vessel intercepts over an eight-month period (May through December 2008) before being discontinued. The significantly higher costs and safety concerns associated with nighttime sampling are not warranted simply to extend coverage to less than 3% of all HMS for-hire trips. Improved coverage of the swordfish fishery (daytime and nighttime) can be better accomplished through modifications to the FHS and NTR. Analysis of HMS tournament trip data also showed only 56% of the reported HMS-targeted tournaments had registered with NOAA Fisheries HMS Management Division. The mandatory registration requirement is necessary for monitoring tournament landed catches through the Recreational Billfish Survey (RBS). Education and enforcement of the registration and RBS reporting requirements are needed to address this gap.

Management Recommendations

Florida's HMS fisheries are highly diversified, requiring different approaches to adequately monitor each segment. The following recommendations address identified deficiencies and data gaps and are aimed at improving future monitoring efforts:

1. The for-hire fishing mode requires sampling methods that are different from private boat and shore fishing modes. Thus, the for-hire fishery should be sampled by an independent program that employs methods specifically designed for the mode, both for effort and catch estimation, regardless if the new program employs surveys and/or logbooks.

2. A modified field intercept survey will provide the most reliable information on HMS released catches for more common species such as sailfish and sharks, as well as total catch information for skipjack tunas and small coastal sharks. The following modifications are recommended:

    - Designate site clusters as the primary sampling unit (PSU) in the MRIP access point intercept survey to incorporate all sites into the probability selection of PSUs. This will facilitate greater sampling efficiency to intercept for-hire vessels returning to multiple access sites and increase opportunities to sample vessels operating out of less active sites. Factors that should be considered when determining site clusters include:

        a) Activity levels and vessel return time patterns at each site,
        b) Distance between sites and local traffic patterns,
        c) Ability to directly observe the ocean access point vessels transit to increase the likelihood of intercepting vessels immediately upon their return.

        - Clusters should be re-evaluated periodically to account for variations in these factors (*e.g.,* seasonal variations and movement of vessels to other ports).

    - Conduct interviews at the vessel-trip level with for-hire captain or crew members. Eliminates reporting burden on for-hire customers and facilitates sampling of for-hire vessels even if customers are unavailable or uncooperative. Cooperation rates and data quality are anticipated to be higher with for-hire vessel representatives in this region. This will also minimize under- and over-inflated frame adjustments based on number of on-board customers.
    - Temporal stratification of access point intercept survey assignment start and end times. This will provide adequate coverage to trips returning throughout the day to collect a representative sample of fishing activity, and reduce bias towards trips that fished less time, closer to shore, and/or returned earlier in the day.

3. Collect catch information for billfish and swordfish via the ongoing For-Hire Telephone Survey throughout Florida and the southeastern United States – Gulf of Mexico region. This will increase sample sizes of released and landed catches for rare species (*i.e.,* swordfish and marlin) to provide fishery managers with recreational CPUEs to supplement existing data gaps for these species. It will also facilitate validation of the NTR to measure compliance with the mandatory reporting requirement to help determine the accuracy of the census. At the same time, it will provide CPUEs for trips that are under-covered by access point intercept surveys (*i.e.,* trips that return at night and/or to private access sites). A more thorough assessment of the accuracy of FHS catch information is needed before production of swordfish and marlin catch estimates from self-reported phone survey data is recommended for these species.

4. The monitoring of HMS landings for billfish, swordfish, and some shark species should be primarily conducted by a census program due to the limitations of any survey to accurately estimate such rare event landings. Improvements to the existing NOAA Fisheries HMS NTR to increase the reporting rate include:

    - Elimination of the 24-hour reporting period allotted to anglers to report landed catches upon returning from a trip to improve the enforceability of the reporting requirement. Landed catches will have to be reported prior to removal of the fish from the vessel.
    - Upgrade NTR to be capable of receiving landing reports and automatically provide a confirmation number. The new system must be capable of accepting landing reports from anglers that do not possess an HMS permit, as is currently possible with the existing telephone and website formats.
    - Provide additional reporting options to anglers to reduce reporting burden and facilitate more timely reporting. These include text messaging, E-mail, and smart phone applications.
    - Provide Law Enforcement real-time access in the field to the reporting system to verify a landings report has been submitted.
    - Extend the reporting requirement to include 7 shark species: bull, great hammerhead, lemon, scalloped hammerhead, smooth hammerhead, shortfin mako, and tiger.
    - Hold all individuals or businesses in possession of a landed billfish, swordfish, bluefin tuna, or above listed sharks, including any part of the fish (*i.e.,* jaws, fins, rostrum, etc.), accountable for ensuring the reporting requirement has been fulfilled.

The results and subsequent recommendations of this study highlight the need for significant modifications as MRIP develops. These recommendations are not limited exclusively to Florida's for-hire fishery. Similarities among the for-hire industry throughout the southeastern U.S. and Gulf of Mexico will likely make these monitoring approaches applicable to addressing coverage gaps for HMS fisheries throughout the region.